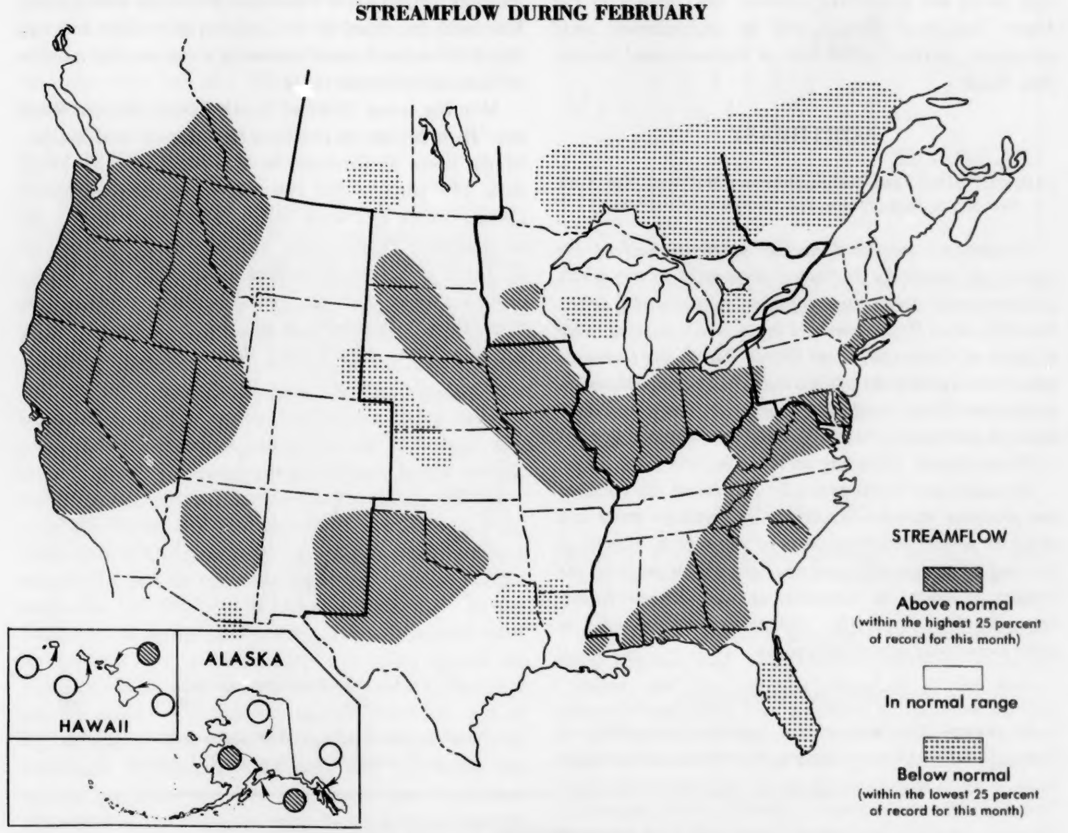
WATER RESOURCES REVIEW for FEBRUARY 1982

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

CANADA
DEPARTMENT OF THE ENVIRONMENT
WATER RESOURCES BRANCH

STREAMFLOW DURING FEBRUARY



STREAMFLOW AND GROUND-WATER CONDITIONS

Streamflow generally decreased in southeastern Canada, Saskatchewan, Maine, Vermont, and South Carolina, increased in Georgia, Mississippi, Virginia, West Virginia, in most of the West and Midcontinent Regions, and in southern parts of the Northeast and Western Great Lakes Regions. Flows were variable elsewhere.

Monthly mean flows remained in the above-normal range in parts of Alaska, California, Connecticut, Georgia, North Carolina, New Mexico, Ohio, Rhode Island, South Carolina, Tennessee, Texas, and Utah, and increased into that range in most Western States and in a broad band extending from Ohio westward to North Dakota. Monthly and/or daily mean flows were highest of record for the month in parts of California, Idaho, Illinois, Oregon, Rhode Island, and Washington. Flooding occurred in Georgia, Idaho, Indiana, Missouri, Nebraska, New York, North Carolina, and Oregon.

Below-normal streamflow persisted in parts of Ontario, Quebec, Arizona, Florida, Kansas, Louisiana, Montana, and Nebraska.

Ground-water levels in the Northeast Region generally continued the trend of the previous month—declining in northern areas and rising in several southern parts of the region. Levels were near average in most of the region; however, in Connecticut and Rhode Island, levels were unusually high in some observation wells. In the Southeast Region, water levels rose in Virginia, North Carolina, Mississippi, and Alabama, and mostly rose in West Virginia and Kentucky. Trends were mixed in Georgia and Florida. Levels were below average in Virginia, and above and below average in other reporting States. In the Western Great Lakes Region, water levels declined in Minnesota, Wisconsin, and Michigan, and rose in Ohio. Levels were below average in Michigan, at or above average in Ohio, and above and below average in Minnesota. In the Midcontinent Region, levels rose in Kansas and Missouri; trends were mixed in other States in the region. Levels were at or above average in Nebraska and Iowa, below average in North Dakota and Arkansas, and above and below average elsewhere. In the West, water levels rose in Washington, Nevada, and New Mexico; trends were mixed in other States. Levels were above average in Washington and Montana, and below average in Idaho, Utah, and New Mexico; they were above and below average in southern California and Nevada.

New February high ground-water levels were reached in Connecticut, Idaho, Iowa, Nevada, and Rhode Island. New low levels for February occurred in Arizona, Arkansas, Florida, Idaho, Kansas, Louisiana, North Dakota, Tennessee, and Texas. New alltime low levels were recorded in Arizona and Idaho.

INDEX OF STREAMFLOW

During February, there were no large areas of the United States that indicated persistent patterns of above- or below-normal streamflow and the index of streamflow for each region generally ranged between the values of +1 and −1. Inasmuch as index values that fall within that range are considered normal, this feature in the Water Resources Review will be discontinued until persistent patterns of above- or below-normal streamflow recur.

NORTHEAST

[Atlantic Provinces and Quebec; Delaware, Maryland, New York, New Jersey, Pennsylvania, and the New England States]

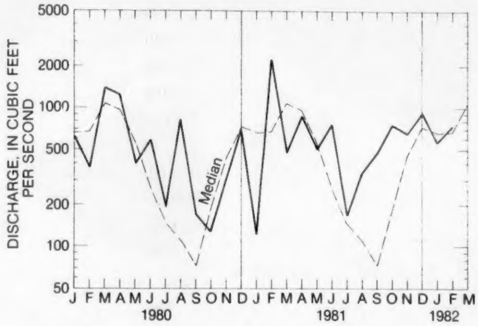
Streamflow increased in the southern half of the region and generally decreased seasonally in the north. Below-normal streamflow persisted in parts of Quebec. Monthly mean flows remained in the above-normal range in parts of Connecticut and Rhode Island, and increased into that range in parts of Delaware, Maryland, Massachusetts, New Jersey, and New York. Monthly and daily mean flows were highest of record for February in parts of Rhode Island. Flooding occurred in New York.

Ground-water levels generally continued the trend of the previous month—declining in northern areas and rising in several southern parts of the region. Levels at the end of the month were near average in most of the region; however, in Connecticut and Rhode Island, unusually high levels (for February) were recorded in some water-level observation wells.

STREAMFLOW CONDITIONS

In central Maryland, where monthly mean flow of Seneca Creek at Dawsonville was below the normal range and only 67 percent of median in January, flow increased sharply as a result of runoff from rains early in the month and was above the normal range for the first time since June 1980. Flow of Potomac River at Washington, D.C., also increased sharply to 178 percent of median and was above the normal range for the first time since June 1981. In the Delmarva Peninsula, monthly mean flow of Choptank River near Greensboro, Maryland, increased to 161 percent of median and was above the normal range following 4 consecutive months of flow in the normal range.

Monthly mean flows of South Branch Raritan River near High Bridge, in northern New Jersey, and Susquehanna River at Conklin, in south-central New York, were 153 percent and 179 percent of their respective median flows and were above the normal range. In northwestern Pennsylvania, monthly mean discharge of Oil Creek at Rouseville increased seasonally to 110 percent of median and was typical of the normal trend in streamflow in Pennsylvania and elsewhere in New Jersey and New York. (See graph.) Runoff from rains early in



Monthly mean discharge of Oil Creek at Rouseville, Pa. (Drainage area, 300 sq mi; 777 sq km)

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the month produced ice jams on several streams and some lowland flooding was reported on the Delaware, Wallkill, and Hoosic Rivers.

In Connecticut, streamflow was above the normal range and averaged 173 percent of median. Usable contents of most reservoir systems were above average for end of February.

In Rhode Island, monthly mean flow at the index station, Pawcatuck River at Wood River Junction (drainage area, 100 square miles), continued to increase seasonally and the monthly mean discharge of 481 cfs and the daily mean flow of 1,050 cfs on the 4th were highest for the month in 42 years of record.

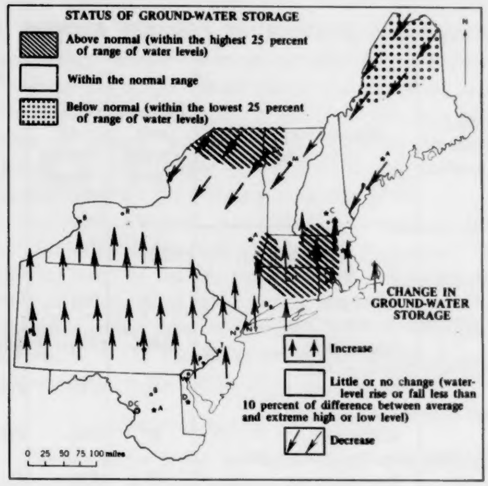
In central Massachusetts, monthly mean flow of Ware River at Intake Works near Barre increased, contrary to the normal seasonal trend, was twice the median flow for February, remained above median for the 8th consecutive month, and was in the above-normal range.

Streamflow in the normal range characterized most of Vermont, New Hampshire, Maine, and the Atlantic Provinces. For example, monthly mean discharge of Piscataquis River near Dover-Foxcroft, in central Maine, decreased seasonally and remained in the normal range for the 4th consecutive month. Several major storms occurred during the month that brought heavy snow to parts of New Brunswick and heavy rain in Nova Scotia. Runoff at index stations was accordingly below median and above median in the respective Provinces.

North of the St. Lawrence River in eastern Quebec, mean flow of Outardes River at Outardes Falls decreased to only 57 percent of median and was below the normal range for the 5th time in the past 6 months. In the south-central part of the Province, monthly mean flow of St. Maurice River at Grand Mere was below median for the 8th consecutive month and was also below the normal range. Similarly, in the southwestern part of the Province, mean flow of Harricana River at Amos continued to decrease seasonally and was below the normal range for the 6th time in the past 7 months. Elsewhere in the Province, mean flows at index stations decreased seasonally but remained in the normal range.

GROUND-WATER CONDITIONS

Ground-water levels generally continued to decline in northern parts of Maine, Vermont, and New York State; and to rise in central and southern New England and in much of New Jersey and Pennsylvania. (See map.) Levels at the end of the month were near average for this time of year in most of the region. Local exceptions included above-average levels in parts of northern New York and Vermont, and average and below-average levels in northern Maine and parts of New Jersey and southeastern New York. Also, levels in some



Map shows ground-water storage near end of February and change in ground-water storage from end of January to end of February.

observation wells in Connecticut and Rhode Island were the highest recorded for February in 25–35 years—a continuation of above-average levels from the previous month.

SOUTHEAST

[Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia]

Streamflow increased seasonally in Georgia, Mississippi, Virginia, and West Virginia, decreased in South Carolina, and was variable elsewhere in the region. Below-normal flows have persisted in southern Florida for 20 months, in response to the continued lack of rainfall and runoff in that part of the State. Monthly mean flows remained in the above-normal range in parts of Georgia, South Carolina, Tennessee, and Virginia, and increased into that range in parts of Alabama, Florida, Mississippi, North Carolina, and West Virginia. Flooding occurred in Georgia and North Carolina.

Ground-water levels rose in Virginia, North Carolina, Mississippi, and Alabama, and mostly rose in West Virginia and Kentucky. Trends were mixed in Georgia and Florida. Levels were below average in Virginia, and above and below average in other reporting States. New low levels for February occurred in Tennessee and Florida.

STREAMFLOW CONDITIONS

Severe flooding of local streams occurred in a narrow band about 50 miles wide from just north of the Chattahoochee River extending about 100 miles into Georgia

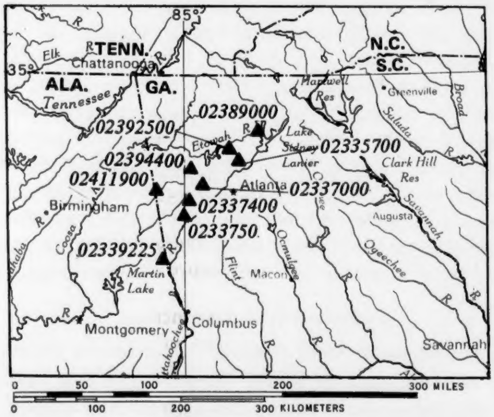
STAGES AND DISCHARGES FOR THE FLOODS OF FEBRUARY 1982 AT SELECTED SITES IN GEORGIA

WRD station number	Stream and place of determination	Drainage area (square miles)	Period of known floods	Maximum flood previously known			Maximum during present flood				
				Date	Stage (feet)	Discharge (cfs)	Date	Stage (feet)	Discharge		Recurrence interval (years)
									Cfs	Cfs per square mile	
	APALACHICOLA RIVER BASIN										
02335700	Big Creek near Alpharetta	72	1961–	Feb. 21, 1961	12.54	5,800	Feb. 3	13.16	6,500	90	30
02337000	Sweetwater Creek near Austell	246	1904–	July 8, 1916	20.00	12,600	4	19.90	10,700	43	50
02337400	Dog River near Douglassville	43	1951–	Feb. 25, 1961	16.15	9,910	3	15.84	9,310	217	45
02337500	Snake Creek near Whitesburg	37	1955–	Feb. 25, 1961	14.40	7,690	3	13.20	6,460	175	25
02339225	Wehadkee Creek below Rock Mills, AL	60.2	1979–	Apr. 13, 1979	12.44	4,400	3	14.40	7,300	121	30
	MOBILE RIVER BASIN										
02389000	Etowah River near Dawsonville	107	1940–	Aug. 24, 1967	(a)	6,140	3	13.15	5,750	54	15
02392500	Little River near Roswell	60.5	1946–	Jan. 7, 1946	15.0	5,000	3	14.78	4,600	76	60
02394400	Pumpkinvine Creek near Dallas	40	1951–	Feb. 23, 1961	20.28	6,800	3	18.30	5,000	125	15
02411900	Tallapoosa River at Tallapoosa	237	1936–	Mar. 31, 1977	29.30	28,300	4	25.59	13,000	55	20

[a] Peak stage, 16.18 ft. on December 12, 1961.

from the Georgia-Alabama boundary on February 3, 4. The flooding was the result of runoff from intense rainfall, from 4 to 7 inches over a 24-hour period that began at 8:00 a.m. on February 2. Streams north and west of Atlanta experienced floods with recurrence intervals of up to 60 years. Selected data on stages, discharges, recurrence intervals, and gaging station locations are given in the accompanying table and map. In extreme northern Georgia, monthly mean discharge of Etowah River at Canton (drainage area, 605 square miles) remained in the above-normal range for the 2d consecutive month and the daily mean flow of 19,100 cfs on February 3 exceeded the previous maximum daily flow for February of 17,200 cfs that occurred in 1961.

In northern Florida, monthly mean discharge of Apalachicola River at Chattahoochee increased sharply to 153 percent of median and was above the normal range for the first time in 20 months. By contrast, in east-central Florida, mean flow of St. Johns River near Christmas decreased seasonally to 18 percent of median and was below the normal range for the 20th consecutive month. Also in southern Florida, the inflow to Lake



Location of stream-gaging stations in Georgia, described in table of peak stages and discharges.

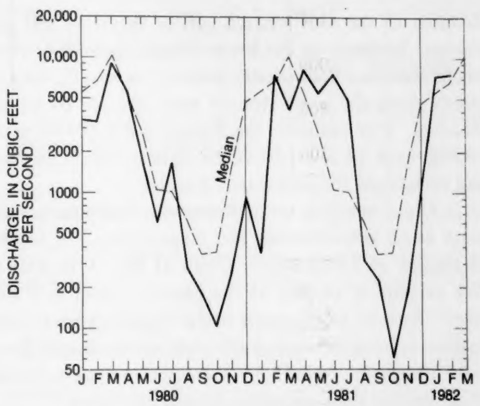
Okeechobee continued to approach record lows. Elsewhere in the State, streamflow increased seasonally and ranged from the below-normal range in the southern

part of the State to the above-normal range in the Florida Panhandle.

In southeastern Alabama, mean flow of Conecuh River at Brantley increased to about twice the median flow for February and was above the normal range for the first time since February 1981. Elsewhere in the State, flows were generally within the normal range.

Streamflow increased over most of Mississippi during February with the larger increases experienced in the southern part of the State where mean flow of Pascagoula River at Merrill increased to 1½ times median and was above the normal range for the first time since September 1981. In the central part of the State, flows were generally less than median but within the normal range.

In northern Kentucky, monthly mean discharge of Licking River at Catawba increased seasonally, remained in the normal range, and was 113 percent of median. (See graph.) Elsewhere in Kentucky and in most of



Monthly mean discharge of Licking River at Catawba, Ky. (Drainage area, 3,300 sq mi; 8,547 sq km)

Tennessee, flows decreased in contrast to the normal seasonal trend, but remained above median and were within the normal range.

In West Virginia, streamflow increased seasonally, ranged from 172 to 212 percent of median, and was above the normal range for the first time in the 1982 water year.

In Virginia, streamflow averaged 160 percent of median during February, up sharply from January's average of 89 percent. Mean flows were highest in the Shenandoah, Rappahannock and upper James River basins while lower flows occurred in the Roanoke and Chowan River basins. In northern Virginia, monthly mean flow of Rapidan River near Culpeper increased sharply to 192 percent of median and was above the normal range for the first time since July 1981.

In North Carolina, streamflow was above median statewide. Runoff from heavy rains during the first week of the month caused minor flooding along most rivers. In the western part of the State, monthly mean flow of French Broad River at Asheville increased sharply to 140 percent of median and was above the normal range for the first time since May 1980.

In South Carolina, streamflow decreased, contrary to the normal seasonal pattern, and was above the normal range in the Pee Dee River basin in the eastern part of the State and in the normal range elsewhere. For example, mean flow of Lynches River at Effingham decreased to 152 percent of median but remained in the above-normal range for the 2d consecutive month.

GROUND-WATER CONDITIONS

Ground-water levels in West Virginia declined in a few western counties and rose elsewhere in the State. Levels were above average in the extreme eastern panhandle and northwestern quarter of the State, but below average elsewhere.

In Kentucky, water levels generally rose and were above average in most parts of the State. Levels declined slightly in Jefferson County and Louisville except in areas near the Ohio River, where levels rose slightly in response to higher river stages.

In Virginia, levels in the three key wells in the Piedmont rose in response to increased precipitation, but continued below average.

In western Tennessee, the level in the key well in the "500-foot" sand aquifer near Memphis declined $1^1/_3$ feet, reaching a new February low.

In North Carolina, levels rose significantly and were above long-term averages in the western Piedmont and Coastal Plain, and were about 1½ feet below normal elsewhere.

In Mississippi, water levels continued to recover slightly in the central part of the State. Levels rose about a foot in wells screened in the Sparta Sand in the Jackson area. In the shallower Cockfield Formation, levels rose slightly but were about 2 feet below those of a year ago. In northern Mississippi, levels in the Wilcox Group and Upper Cretaceous aquifers showed normal seasonal recoveries. In the southern part of the State, levels in the Miocene sands and Graham Ferry Formation along the Gulf Coast rose slightly; however, long-term declining trends continued. Water levels in the shallow water-table aquifers rose moderately statewide.

In Alabama, the level in the well at Centreville rose slightly but was slightly below average; in the well at Montgomery, the level rose and was above average.

In Georgia, levels in the Piedmont rose 2 to 4 feet. In the Chatham County area in the southeast, levels in

the principal artesian aquifer declined as much as 5 feet near the center of pumping; in outlying areas levels rose slightly. Levels rose slightly in Bryan and Liberty Counties. Levels held steady near Brunswick. In the southwest, levels rose 2½ to 4½ feet.

In Florida, water levels in the principal aquifer, the Floridan, declined in about half of the wells and rose in the others. Two key wells, one at Lake City and the other at Jacksonville, established new February lows. Water levels in the Biscayne aquifer in south Florida fell, but remained in the normal range; levels in the sand and gravel aquifer of western Florida rose but continued in the below-normal range.

WESTERN GREAT LAKES REGION

[Ontario; Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin]

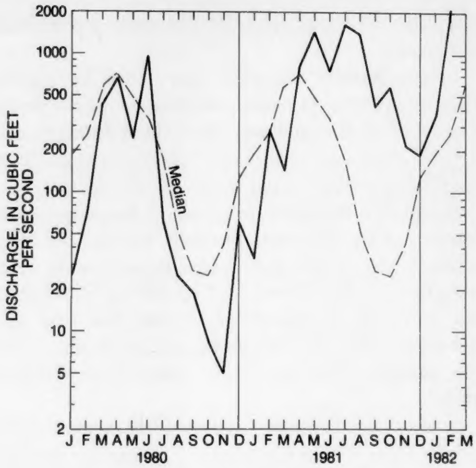
Streamflow increased seasonally in Illinois, Indiana, and Ohio, and was variable elsewhere in the region. Below-normal streamflow persisted in parts of Ontario and decreased into that range in parts of Wisconsin. Monthly mean flows remained in the above-normal range in parts of Ohio and increased into that range in parts of Illinois, Indiana, and Minnesota. Monthly and/or daily mean flows were highest of record for February in parts of Illinois. Flooding occurred in Indiana.

Ground-water levels declined in Minnesota, Wisconsin, and Michigan, and rose in Ohio. Levels were below average in Michigan, at or above average in Ohio, and above and below average in Minnesota.

STREAMFLOW CONDITIONS

In east-central Illinois, the monthly mean flow of 2,140 cfs at the index station, Sangamon River at Monticello (drainage area, 550 square miles) was highest for February in 74 years of record, over 8 times the February median flow and 13 percent greater than the previous February maximum monthly mean discharge of 1,899 cfs, which occurred in 1959. (See graph.) In the southern part of the State, the monthly mean flow of 2,940 cfs, and the daily mean of 12,900 cfs on the 5th at Skillet Fork at Wayne City (drainage area, 464 square miles) were highest for February in 65 years of record. This monthly mean discharge was over 6 times the February median flow. In the northern part of the State, monthly mean flows at index stations in the Rock River basin were less than median but within the normal range.

In Indiana, streamflow was above the normal range as a result of above-normal rainfall in the south and snowmelt runoff in the north. Isolated small areas experienced flooding in the southeastern part of the State and agricultural lowlands in the lower Wabash and White River basins remained under water most of the month. Several points along the larger streams were affected by ice jam flooding. For example, the Wabash River at Covington on February 24 experienced its highest stage since 1969 and threatened the Interstate 74 bridge.



Monthly mean discharge of Sangamon River at Monticello, Ill. (Drainage area, 550 sq mi; 1,420 sq km)

In Ohio, monthly mean flows were above the normal range at all index stations and ranged from 170 percent of median at Little Beaver Creek at East Liverpool to 284 percent of median at the Maumee River at Waterville. Contents of reservoirs in the Mahoning River basin upstream from Newton Falls and in the Scioto River basin upstream from Higby increased and were 56 and 85 percent of their respective normal capacities.

In Michigan, streamflow was below median but within the normal range throughout the State as a result of moderating temperatures during the last half of the month. Levels of inland lakes were near or slightly below their long-term averages.

In western Ontario, monthly mean discharge of English River at Umfreville continued to decrease seasonally, was ½ the median flow for February, and remained in the below-normal range for the 10th consecutive month. In the eastern part of the Province, north of Lake Huron, mean flow of Missinaibi River at Mattice increased, contrary to the normal seasonal pattern, was 58 percent of median, and remained in the below-normal range for the 7th consecutive month. In extreme southeastern Ontario, mean flow of Saugeen River near Port Elgin decreased to 58 percent of median and was below the normal range for the first time in 2 years.

(Continued on page 8.)

SELECTED DATA FOR THE GREAT LAKES, GREAT SALT LAKE, AND OTHER HYDROLOGIC SITES

GREAT LAKES LEVELS

Water levels are expressed as elevations in feet above International Great Lakes Datum 1955

(Data furnished by National Ocean Survey, NOAA, via U.S. Army Corps of Engineers office in Detroit. To convert data to elevations in feet above National Geodetic Vertical Datum of 1929 (NGVD), formerly called sea level datum of 1929, add the following values: Superior, 0.96; Michigan-Huron, 1.20; St. Clair, 1.24; Erie, 1.57; Ontario, 1.22.)

Lake	February 28, 1982	Monthly mean, February		February		
		1982	1981	Average 1900–75	Maximum (year)	Minimum (year)
Superior (Marquette, Mich.)	599.58	599.68	600.02	600.13	601.18 (1975)	598.37 (1926)
Michigan and Huron (Harbor Beach, Mich.)	578.12	578.21	578.51	577.69	579.91 (1952)	575.44 (1964)
St. Clair (St. Clair Shores, Mich.)	574.26	574.13	574.19	572.22	575.39 (1974)	569.88 (1926)
Erie (Cleveland, Ohio)	571.26	571.20	570.72	569.72	572.53 (1973)	567.49 (1936)
Ontario (Oswego, N.Y.)	244.17	244.22	243.94	244.08	246.46 (1952)	241.59 (1936)

LAKE WINNIPEG AT GIMLI, MANITOBA

Alltime high: 718.26 (July 1974). Alltime low: 709.62 (February 1941).	Monthly mean, February				
	1982	1981	Average 1913–81	Maximum (year)	Minimum (year)
Elevation in feet above NGVD:	712.70	712.77	713.09	716.18 (1975)	709.62 (1941)

GREAT SALT LAKE

Alltime high: 4,211.6 (1873). Alltime low: 4,191.35 (October 1963).	February 28, 1982	February 28, 1981	February		
			Average, 1904–81	Maximum (year)	Minimum (year)
Elevation in feet above NGVD:	4,199.20	4,199.85	4,198.41	4,204.70 (1924)	4,191.90 (1964)

LAKE CHAMPLAIN, AT ROUSES POINT, N.Y.

Alltime high (1827–1980): 102.1 (1869). Alltime low (1939–1980): 92.17 (1941).	February 26, 1982	February 26, 1981	February		
			Average, 1939–78	Max. daily (year)	Min. daily (year)
Elevation in feet above NGVD:	95.74	98.64	95.38	98.30 (1973)	93.55 (1948)

FLORIDA

Site	February 1982		January 1982	February 1981
	Discharge in cfs	Percent of normal	Discharge in cfs	Discharge in cfs
Silver Springs near Ocala (northern Florida)	590	78	580	720
Miami Canal at Miami (southeastern Florida)	0	0	0	88
Tamiami Canal outlets, 40-mile bend to Monroe	6.8	30	19	28

(Continued from page 6.)

In central Minnesota, monthly mean flow of Crow River at Rockford decreased but was above the normal range and remained above median for the 9th consecutive month. Elsewhere in the State, streamflow was generally within the normal range.

In eastern Wisconsin, monthly mean flow of Fox River at Rapide Croche Dam, near Wrightstown decreased seasonally to 60 percent of median and was below the normal range for the first time since July 1981. In the northwestern part of the State, mean discharge of Chippewa River of Chippewa Falls also decreased to about 60 percent of median and was below the normal range for the first time in the 1982 water year. Elsewhere in Wisconsin, mean flows at other index stations increased, were generally less than median, and were within the normal range.

GROUND-WATER CONDITIONS

In Minnesota, ground-water levels in shallow water-table wells generally declined throughout the State, but were 2.5 feet above average in the south and 1.5 feet below average in the north. This is the seventh consecutive month in the previous 21 months that levels have been above average in southern Minnesota.

In Wisconsin, water levels continued to decline throughout the State.

Levels generally declined in Michigan and were below average in most areas.

In northwestern Illinois, the water level in the water-table well in glacial drift at Princeton, in Bureau County, rose more than 2 feet and continued above average by 4.7 feet.

In Ohio, levels rose and were about normal in the central part of the State and slightly above normal in the northeast.

MIDCONTINENT

[Manitoba and Saskatchewan; Arkansas, Iowa, Kansas, Louisiana, Missouri, Nebraska, North Dakota, Oklahoma, South Dakota, and Texas]

Streamflow increased seasonally except for parts of Saskatchewan, North Dakota, Arkansas, and Texas, where streamflow decreased. Above-average temperatures during the last half of the month resulted in snowmelt runoff and accompanying ice jams that caused some lowland flooding. Monthly mean flows were in the above-normal range at 11 of 26 index stations, compared to only 2 stations in that range in January. Below-normal flows persisted in parts of Kansas, Louisiana, and Nebraska, and decreased into that range in parts of Saskatchewan and Texas.

Ground-water levels rose in Kansas and Missouri; trends were mixed in other States in the region. Levels were at or above average in Nebraska and Iowa, below average in North Dakota and Arkansas, and above and below average elsewhere. A new high level for February was recorded in Iowa, and new lows for February occurred in North Dakota, Kansas, Arkansas, Louisiana, and Texas.

STREAMFLOW CONDITIONS

High temperatures during the latter half of the month resulted in rapid snowmelt and a high volume of runoff in southwestern North Dakota. The monthly mean flow of the Cannonball River at Breien was 260 times the median for February and above the normal range. In the northeastern part of the State, mean flow of the Red River of the North at Grand Forks was 97 percent of median and remained in the normal range.

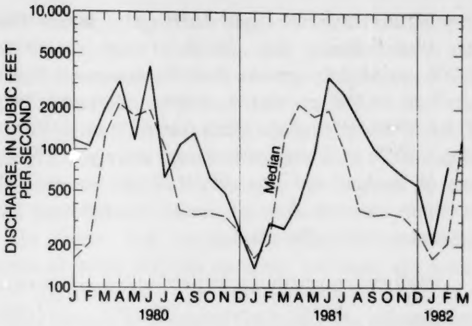
In central South Dakota, where flow of Bad River near Fort Pierre had ceased for 5 consecutive months, prior to February, flow increased dramatically to 4,200 times the median. In the eastern part of the State, mean flow of Big Sioux River, as measured at Akron, Iowa, also increased and was 139 percent of median but remained in the normal range.

By contrast, in Saskatchewan, monthly mean flow of Qu'Appelle River near Lumsden was below the normal range at 74 percent of median.

In northeastern Nebraska, snowmelt runoff during the second half of the month significantly increased flow in the Elkhorn River at Waterloo. The monthly mean flow at this index station was over 3 times median and above the normal range. Ice jams caused lowland flooding in the eastern part of the State. In the northwestern part of the State, mean flow of Niobrara River above Box Butte Reservoir also increased, was 87 percent of median, but remained in the below-normal range for the 4th consecutive month.

In Iowa, streamflow increased significantly and was above the normal range at all index stations. Monthly mean flows ranged from 234 percent of median in northwestern Iowa to 431 percent of median in southwestern Iowa. In the northwestern part of the State, monthly mean discharge of Des Moines River at Fort Dodge increased sharply and remained above median for the 9th consecutive month. (See graph on page 9.)

In Missouri, snowmelt runoff during the latter half of the month boosted streamflow into the above-normal range at both index stations and flooding was common on most streams. Monthly mean flows of Gasconade River at Jerome and Grand River near Gallatin increased sharply, were 405 and 366 percent of their respective median flows, and were above the normal range for the first time since July 1981.

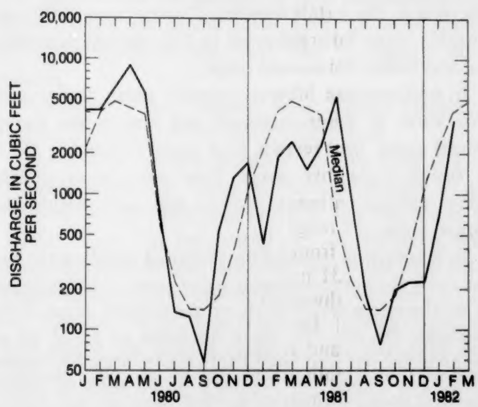


Monthly mean discharge of Des Moines River at Fort Dodge, Iowa (Drainage area, 4,190 sq mi; 10,850 sq km)

In northeastern Kansas, mean flow of Little Blue River near Barnes increased to 146 percent of median and was in the normal range. In the northwestern part of the State, monthly mean discharge of Saline River near Russell also increased but was only 23 percent of median and remained in the below-normal range for the 4th consecutive month.

In Oklahoma, monthly mean flow of Washita River near Dickson increased significantly to 379 percent of median and was above the normal range.

In southern Arkansas, where monthly mean flow of Saline River near Rye was below the normal range in December and January, flow increased sharply to 87 percent of median and was within the normal range. (See graph.) In the northern part of the State, flow at Buffalo



Monthly mean discharge of Saline River near Rye, Ark. (Drainage area, 2,062 sq mi; 5,340 sq km)

River near St. Joe decreased and was within the normal range.

In northwestern Louisiana, mean flow of Saline Bayou near Lucky increased to 53 percent of median for February but remained in the below-normal range for the 4th consecutive month. By contrast, in the southeastern part of the State, monthly mean flow of Amite River near Denham Springs was 186 percent of median and above the normal range. Mean flows at other index stations were within the normal range. For example, in the southwestern part of the State, where mean flow of Calcasieu River near Oberlin had been below the normal range for 5 consecutive months, mean flow for February increased sharply to nearly 4 times the January 1982 mean discharge, but remained below median for the 6th consecutive month.

In western Texas, monthly mean discharge of North Concho River near Carlsbad was 230 times median and remained in the above-normal range for the 5th consecutive month. By contrast, monthly mean discharge of Neches River near Rockland in eastern Texas was below the normal range at 62 percent of median. Streamflow elsewhere in the State was within the normal range.

GROUND-WATER CONDITIONS

In North Dakota, the ground-water level in the well tapping the Sheyenne Delta aquifer in the southeastern part of the State declined slightly and was more than a foot below average. In the southwest, the level in the key well in the Sentinel Butte Formation rose slightly but was at a new February low in 14 years of record.

In Nebraska, water levels rose slightly in most deep observation wells. Levels declined slightly in most shallow water-table wells and were near or slightly above average at month's end.

In Iowa, levels in shallow water-table wells generally rose in the southern half of the State in response to recharge from snowmelt. All stations recorded above-average levels. A new February high was observed in the shallow key well at Marion, in Linn County, in 41 years of record.

In Kansas, levels rose slightly in the four key wells; levels were below average except for the Douglas County well, in which the level was slightly above average. Despite a slight rise, the level in the key well at the Kansas Agricultural Experiment Station at Colby, in Thomas County, was at a new February low in 35 years of record.

In Missouri, ground-water levels generally continued to recover in response to high stream stages.

In Arkansas, levels in the key well in the deep aquifer—the Sparta Sand—rose 5½ feet but was 25 feet below average. The level in the key well at El Dorado rose more than 6 feet, but was nearly 23 feet below average. In the Sparta Sand aquifer at Pine Bluff, the level in the key well declined nearly 3 feet, reaching a new February low in 24 years of record.

In Louisiana, wells rose in response to increased precipitation in the Red River alluvial aquifer. However, levels in the Miocene and Sparta Sand aquifers continued to decline. Levels fluctuated seasonally in northern Louisiana, rising moderately. In the southwest, levels generally rose in the wells in the Chicot aquifer; despite rising trends, several new lows for February were recorded..Levels rose in the Lake Charles industrial area. In the southeast, water levels continued normal seasonal rising trends.

In Texas, the water level rose ½ foot in the key well in bolson deposits at El Paso, but nevertheless was at a new February low in 17 years of record. Levels declined and were below average in the key wells in the Edwards Limestone at San Antonio and in the Evangline aquifer at Houston. The level in the well in the Edwards Limestone at Austin declined but was above average.

WEST

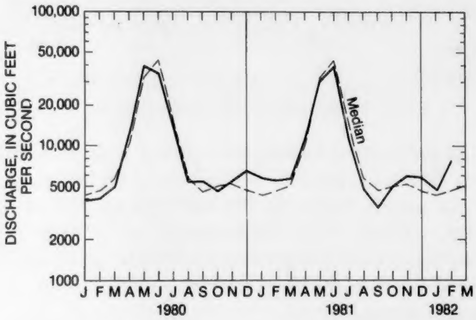
[Alberta, and British Columbia; Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming]

Streamflow increased in Alberta, Idaho, Nevada, Oregon, and Washington, and was variable elsewhere in the region. Monthly mean flows remained in the above-normal range in parts of California, New Mexico, and Utah, and increased into that range in parts of Alberta, Arizona, Idaho, Montana, Nevada, Oregon, and Washington. Below-normal streamflow persisted in parts of Arizona and Montana. Monthly mean flows were highest of record for February in parts of California, Idaho, and Washington. Flooding occurred in Idaho and Oregon.

Ground-water levels rose in Washington, Nevada, and New Mexico; trends were mixed in other States in the region. Levels were above average in Washington and Montana, below average in Arizona, and mostly below average in Idaho, Utah, and New Mexico; they were above and below average in southern California and Nevada. New high levels for February were reached in Idaho and Nevada, and new lows for February occurred in Idaho and Arizona. New alltime low levels were recorded in Idaho and Arizona.

STREAMFLOW CONDITIONS

In northern Idaho, the monthly mean flow of 25,720 cfs at the index station, Clearwater River at Spalding (drainage area, 9,570 square miles) was highest for February in 60 years of record. Similarly, mean flows were highest of record for the month in the Weiser and Boise Rivers, and were the second highest of record for the Kootenai and Salmon Rivers, and for the Snake River at Weiser. Flooding occurred in the lower Weiser River basin where the peak discharge at Weiser River near Weiser during this period of high runoff was 20,000 cfs, slightly greater than the maximum flow of record of 19,900 cfs that occurred in December 1955. In the central part of the State, monthly mean flow of Salmon River at Whitebird increased sharply to 172 percent of median and was only 180 cfs less than the maximum monthly flow of record for February that occurred in 1963. (See graph.)



Monthly mean discharge of Salmon River at White Bird, Idaho (Drainage area, 13,550 sq mi; 35,090 sq km)

In northwestern Montana, streamflow increased sharply and was in the above-normal range, following several months of flow in the below-normal range. In the Yellowstone River basin in southern Montana, mean flow of Yellowstone River at Corwin Springs decreased seasonally and was below the normal range for the 7th time in the past 8 months. Downstream at Billings, monthly mean flow increased to 122 percent of median and was within the normal range.

In southwestern Alberta, monthly mean discharge of Bow River at Banff increased and was in the above-normal range for the first time since September 1981. In British Columbia, mean flows were at or slightly below median at index stations and were within the normal range.

In Washington, streamflow increased significantly and was above the normal range at six of seven index stations. In northwestern Washington, on the western slope of the Cascades, the monthly mean discharge of 8,944 cfs at Skykomish River near Gold Bar (drainage area, 535 square miles) was highest for February in 54 years of record and above the normal range for the first time since February of last year. In the eastern part of the State, mean flow of Spokane River at Spokane increased sharply to over 3 times the median flow and was only 390 cfs less than the maximum February discharge on record of 20,910 cfs which occurred in 1961.

In Oregon, runoff from heavy rains and low-level snowmelt caused most streams to reach bankfull stages

by February 16. Flooding was minor and generally limited to pasture lands. Monthly mean flows at all index stations increased and were in the above-normal range. In the north-central part of the State, the monthly mean discharge of 8,400 cfs at the index station, John Day River at Service Creek (drainage area, 5,090 square miles), was highest for February in 54 years of record and was 4 times the median flow for February.

In central and northern California, monthly mean flows at index stations generally increased and were in the above-normal range. On the western slope of the Sierra Nevada in northern California, the monthly mean flow of 4,011 cfs in North Fork American River at North Fork Dam (drainage area, 342 square miles) was highest for the month in 41 years of record, and mean flow at that site was above the normal range for the 3d time in the past 4 months. Combined contents of 10 index reservoirs in central and northern California increased and at month's end were 118 percent of average and 102 percent of the contents one year ago.

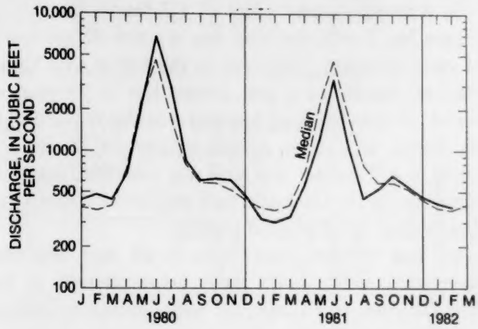
In northern Nevada, monthly mean discharge of Humboldt River at Palisade increased sharply to 3 times the February median flow and was above the normal range for the first time since December 1980.

In southwestern Utah, monthly mean flow of Beaver River near Beaver increased seasonally to 121 percent of median and was above the normal range. In the northern part of the State, mean flows of Big Cottonwood Creek near Salt Lake City and Weber River near Oakley also increased seasonally and were above the normal range at 138 percent and 116 percent of their respective median flows. Elsewhere in the State, flows at index stations generally increased and were near or slightly above median.

Contents of the Colorado River Storage Project decreased 297,300 acre-feet during the month.

In northern Arizona, monthly mean discharge of Little Colorado River near Cameron increased sharply to over 7 times the February median flow and was above the normal range. In the central part of the State, mean flows of Salt River near Roosevelt and Verde River below Tangle Creek, above Horseshoe Dam, increased to 228 and 586 percent of their respective median flows, and were above the normal range for the first time since October 1981. In the extreme southern part of the State, mean flow of San Pedro River at Charleston decreased to 65 percent of median and remained in the below-normal range for the 4th consecutive month.

In southeastern New Mexico, mean flow of Delaware River near Red Bluff decreased seasonally but remained in the above-normal range for the 4th consecutive month at over twice the median flow. In the north-central part of the State, mean flow of Pecos River near Pecos increased seasonally to 164 percent of median and was above the normal range for the first time since July 1980. Elsewhere in New Mexico and throughout most of Colorado and Wyoming, monthly mean flows at index stations generally increased and were within the normal range. (See graph of Roaring Fork River at Glenwood Springs, Colorado.)



Monthly mean discharge of Roaring Fork River at Glenwood Springs, Colo. (Drainage area, 1,451 sq mi; 3,758 sq km)

GROUND-WATER CONDITIONS

In Washington, the level in the key well at Spokane, in the eastern part of the State, rose nearly 4 feet and was more than a foot above average. In the western part of the State, the well at Tacoma rose slightly and continued more than 6 feet above average.

In Idaho, the level in the key well in the sand and gravel aquifer in the Boise Valley, rose and reached a new February high for the period of record 1934–1982; the rise was due to percolation of snowmelt runoff. Levels in the key wells in the Snake River Plain aquifer were at new February lows at Atomic City (despite a slight net rise) and at Rupert, in 33 and 32 years of record, respectively. The level in the key well at Eden, in the southwestern part of the Snake River Plain aquifer, declined slightly, reaching a new alltime low in 25 years of record. The levels in the wells at Gooding and in the alluvium underlying the Rathdrum Prairie declined and were below average.

In Montana, the level in the well at Missoula rose slightly and was above average, and the level in the Hamilton Fairgrounds well declined slightly but was above average.

In southern California, in Santa Barbara County, water levels in the key wells declined in the Santa Ynez and Upper Cuyama Valleys; levels were below and above average, respectively. In Santa Maria Valley, the level in the key well rose and was above average.

In Nevada, the level in the key well in Las Vegas Valley rose but was below average. In Paradise and

Steptoe Valleys, the levels in the key wells rose and reached new February highs in 36 and 32 years of record, respectively.

In Utah, although levels generally declined statewide, they rose but were below average in the Flowell and Holladay areas. Levels declined and were below average in the Logan area, and declined but were above average in the Blanding area.

In Arizona, despite a rise of 1.7 feet in the City of Tucson No. 2 well, the level was at a new alltime low in 14 years of record. The level in the well at Avra Valley declined slightly to a new alltime low in 19 years of record. A new February low was recorded in the well in the Elfrida area, after a slight decline, in 31 years of record. A February low also was recorded, despite a 3-foot rise, in the Litchfield Park well in the western Salt River Valley, in 17 years of record.

In New Mexico, levels rose in all four reporting observation wells; levels were below average in the Hrna, Dayton, and Lovington wells, but above average in the Berrendo-Smith well.

ALASKA

Streamflow generally decreased seasonally, except for Little Susitna River near Palmer where streamflow increased from last month. In south-coastal Alaska, monthly mean flow of Kenai River at Cooper Landing remained in the above-normal range for the 4th consecutive month and was 158 percent of median. Similarly, mean flow of Little Susitna River near Palmer was above the normal range and 170 percent of median. In interior Alaska, mean flow of Chena River at Fairbanks was in the normal range and slightly above median.

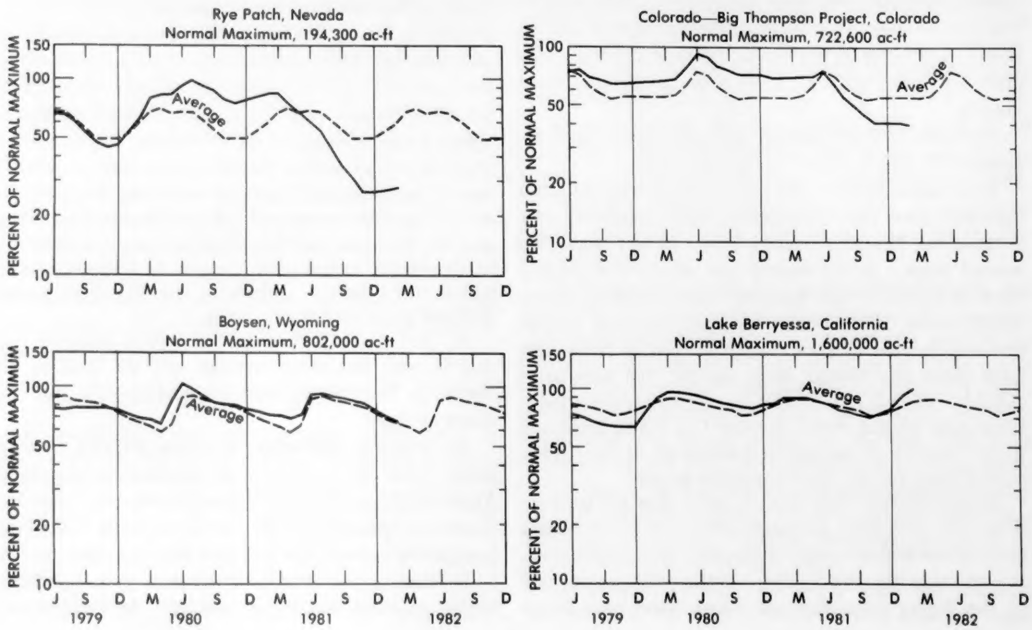
Ground-water levels continued to decline 1.5 to 3 feet in the Anchorage bowl. However, levels in the northwestern part of the bowl rose about 4 feet owing to recharge following a decrease in municipal pumping.

HAWAII

Streamflow increased on the island of Maui but decreased elsewhere. Monthly mean flow of Honopou Stream near Huelo, Maui, was 270 percent of median and above the normal range for the first time since September 1980. Monthly mean flows at index stations on the other islands decreased seasonally and were near or slightly above the median flows for February.

On Guam, Mariana Islands, where monthly mean flow of Ylig River near Yona was in the normal range last month, streamflow increased and was in the above-normal range at 355 percent of the median flow for February.

USABLE CONTENTS OF SELECTED RESERVOIRS AND RESERVOIR SYSTEMS
June 1979 to February 1982



DISSOLVED SOLIDS AND WATER TEMPERATURES FOR FEBRUARY AT DOWNSTREAM SITES ON SIX LARGE RIVERS

Station number	Station name	February data of following calendar years	Stream discharge during month	Dissolved-solids concentration during month[a]		Dissolved-solids discharge during month[a]			Water temperature during month[b]		
			Mean (cfs)	Minimum (mg/L)	Maximum (mg/L)	Mean (tons per day)	Minimum (tons per day)	Maximum (tons per day)	Mean, in °C	Minimum, in °C	Maximum, in °C
	NORTHEAST										
01463500	Delaware River at	1982	13,580	84	114	3,593	2,069	8,816	2.0	0	4.0
	Trenton, N.J.	1945–81	13,550	61	144	......	647	11,000	...	0	8.5
	(Morrisville, Pa.)	(Extreme yr)		(1954)	(1977)		(1976)	(1981)			
			[c]12,240								
04264331	St. Lawrence River at	1982	250,000	165	166	112,000	108,000	114,000	1.0	0.5	1.0
	Cornwall, Ontario, near	1976–81	250,600	165	168	113,000	90,000	134,000	0.5	0.5	1.0
	Massena, N.Y.	(Extreme yr)		(1981)	(1976, 78–79)		(1977)	(1978)			
	median streamflow at		[c]233,100								
	Ogdensburg, N.Y.										
	SOUTHEAST										
07289000	Mississippi River at	1982	997,800	155	194	443,000	319,000	543,000	5.0	2.0	7.0
	Vicksburg, Miss.	1976–81	505,700	160	286	280,000	108,000	460,000	4.0	0	10.5
		(Extreme yr)		(1979)	(1981)		(1977)	(1978)			
			[c]679,000								
	WESTERN GREAT LAKES REGION										
03612500	Ohio River at lock and dam	1982	*723,000	128	157	......	233,000	354,000	.....	1.5	3.5
	53, near Grand Chain, Ill.	1955–81	430,900	98	308	......	44,900	419,000	.....	0	10.0
	(25 miles west of Paducah,	(Extreme yr)		(1957)	(1967)		(1955)	(1974)			
	Ky.; streamflow station		[c]410,900								
	at Metropolis, Ill.)										
	MIDCONTINENT										
06934500	Missouri River at Hermann,	1982	128,000	225	392	95,700	52,100	161,000	3.0	0	6.5
	Mo. (60 miles west of St.	1976–81	43,330	208	530	50,200	23,500	105,000	3.0	0	12.0
	Louis, Mo.)	Extreme yr)		(1979)	(1981)		(1977)	(1979)			
			[c]49,190								
	WEST										
14128910	Columbia River at	1982	234,000	89	116	65,700	38,800	106,500	4.0	3.0	5.0
	Warrendale, Oreg.	1976–81	169,500	87	128	46,700	24,800	78,400	4.0	0.5	7.0
	(streamflow station	(Extreme yr)		(1976)	(1977)		(1977)	(1979)			
	at The Dalles, Oreg.)		[c]103,550								

[a]Dissolved-solids concentrations when not analyzed directly, are calculated on basis of measurements of specific conductance.
[b]To convert °C to °F: $[(1.8 \times °C) + 32] = °F$.
[c]Median of monthly values for 30-year reference period, water years 1951–80, for comparison with data for current month.
*Dissolved-solids discharge and water-temperature records are for the first 15 days of the month.

Provisional data; subject to revision

USABLE CONTENTS OF SELECTED RESERVOIRS NEAR END OF FEBRUARY 1982

[Contents are expressed in percent of reservoir capacity. The usable storage capacity of each reservoir is shown in the column headed "Normal maximum."]

Reservoir Principal uses: F–Flood control I–Irrigation M–Municipal P–Power R–Recreation W–Industrial	End of Jan. 1982	End of Feb. 1982	End of Feb. 1981	Average for end of Feb.	Normal maximum
	Percent of normal maximum				
NORTHEAST REGION					
NOVA SCOTIA					
Rossignol, Mulgrave, Falls Lake, St. Margaret's Bay, Black, and Ponhook Reservoirs (P)	79	82	73	59	226,300 (a)
QUEBEC					
Allard (P)	64	38	68	30	280,600 ac-ft
Gouin (P)	57	47	65	51	6,954,000 ac-ft
MAINE					
Seven reservoir systems (MP)	68	52	56	40	178,500 mcf
NEW HAMPSHIRE					
First Connecticut Lake (P)	39	20	40	18	3,330 mcf
Lake Francis (FPR)	45	23	71	30	4,326 mcf
Lake Winnipesaukee (PR)	52	44	86	50	7,220 mcf
VERMONT					
Harriman (P)	47	36	80	31	5,060 mcf
Somerset (P)	57	50	79	51	2,500 mcf
MASSACHUSETTS					
Cobble Mountain and Borden Brook (MP)	72	75	82	69	3,394 mcf
NEW YORK					
Great Sacandaga Lake (FPR)	57	43	78	36	34,270 mcf
Indian Lake (FMP)	64	52	81	41	4,500 mcf
New York City reservoir system (MW)	68	78	61	....	547,500 mg
NEW JERSEY					
Wanaque (M)	69	87	47	79	27,730 mg
PENNSYLVANIA					
Allegheny (FPR)	22	24	25	23	51,400 mcf
Pymatuning (FMR)	83	83	86	86	8,191 mcf
Raystown Lake (FR)	59	53	51	49	33,190 mcf
Lake Wallenpaupack (PR)	52	51	51	50	6,875 mcf
MARYLAND					
Baltimore municipal system (M)	63	74	78	90	83,340 mg
SOUTHEAST REGION					
NORTH CAROLINA					
Bridgewater (Lake James) (P)	86	85	86	83	12,580 mcf
Narrows (Badin Lake) (P)	91	92	93	101	5,616 mcf
High Rock Lake (P)	54	66	38	75	10,230 mcf
SOUTH CAROLINA					
Lake Murray (P)	84	90	84	69	70,300 mcf
Lakes Marion and Moultrie (P)	94	91	77	75	81,100 mcf
SOUTH CAROLINA--GEORGIA					
Clark Hill (FP)	70	85	69	66	75,360 mcf
GEORGIA					
Burton (PR)	81	78	72	68	104,000 ac-ft
Sinclair (MPR)	93	93	97	86	214,000 ac-ft
Lake Sidney Lanier (FMPR)	38	50	51	57	1,686,000 ac-ft
ALABAMA					
Lake Martin (P)	73	88	74	76	1,373,000 ac-ft
TENNESSEE VALLEY					
Clinch Projects: Norris and Melton Hill Lakes (FPR)	49	50	23	38	1,156,000 cfsd
Douglas Lake (FPR)	23	22	25	22	703,100 cfsd
Hiwassee Projects: Chatuge, Nottely, Hiwassee, Apalachia, Blue Ridge, Ocoee 3, and Parksville Lakes (FPR)	49	56	41	49	510,300 cfsd
Holston Projects: South Holston, Watauga, Boone, Fort Patrick Henry, and Cherokee Lakes (FPR)	46	53	35	41	1,452,000 cfsd
Little Tennessee Projects: Nantahala, Thorpe, Fontana, and Chilhowee Lakes (FPR)	59	58	34	47	745,200 cfsd
WESTERN GREAT LAKES REGION					
WISCONSIN					
Chippewa and Flambeau (PR)	47	39	48	25	15,900 mcf
Wisconsin River (21 reservoirs) (PR)	32	18	35	16	17,400 mcf
MINNESOTA					
Mississippi River headwater system (FMR)	21	20	20	18	1,640,000 ac-ft
MIDCONTINENT REGION					
NORTH DAKOTA					
Lake Sakakawea (Garrison) (FIPR)	72	70	71	80	22,700,000 ac-ft
SOUTH DAKOTA					
Angostura (I)	54	57	73	76	127,600 ac-ft
Bell Fourche (I)	37	43	41	53	185,200 ac-ft
Lake Francis Case (FIP)	64	72	63	73	4,834,000 ac-ft
Lake Oahe (FIP)	66	71	76	....	22,530,000 ac-ft
MIDCONTINENT REGION—Continued					
SOUTH DAKOTA—Continued					
Lake Sharpe (FIP)	101	102	101	96	1,725,000 ac-ft
Lewis and Clarke Lake (FIP)	92	79	82	83	477,000 ac-ft
NEBRASKA					
Lake McConaughy (IP)	79	80	80	74	1,948,000 ac-ft
OKLAHOMA					
Eufaula (FPR)	86	102	75	82	2,378,000 ac-ft
Keystone (FPR)	80	100	84	89	661,000 ac-ft
Tenkiller Ferry (FPR)	90	110	86	89	628,200 ac-ft
Lake Altus (FIMR)	12	16	20	53	133,000 ac-ft
Lake O'The Cherokees (FPR)	86	98	76	79	1,492,000 ac-ft
OKLAHOMA--TEXAS					
Lake Texoma (FMPRW)	86	94	84	86	2,722,000 ac-ft
TEXAS					
Bridgeport (IMW)	99	100	28	43	386,400 ac-ft
Canyon (FMR)	94	93	93	75	385,600 ac-ft
International Amistad (FIMPW)	106	103	89	83	3,497,000 ac-ft
International Falcon (FIMPW)	95	91	88	75	2,668,000 ac-ft
Livingston (IMW)	102	101	91	83	1,788,000 ac-ft
Possum Kingdom (IMPRW)	90	88	87	95	570,200 ac-ft
Red Bluff (PI)	18	19	25	31	307,000 ac-ft
Toledo Bend (P)	90	90	82	84	4,472,000 ac-ft
Twin Buttes (FIM)	49	50	44	32	177,800 ac-ft
Lake Kemp (IMW)	58	59	44	86	268,000 ac-ft
Lake Meredith (FWM)	35	34	18	36	796,900 ac-ft
Lake Travis (FIMPRW)	100	98	99	81	1,144,000 ac-ft
THE WEST					
WASHINGTON					
Ross (PR)	55	40	86	41	1,052,000 ac-ft
Franklin D. Roosevelt Lake (IP)	98	91	98	66	5,022,000 ac-ft
Lake Chelan (PR)	48	40	65	36	676,100 ac-ft
Lake Cushman	84	92	90	85	359,500 ac-ft
Lake Merwin (P)	100	135	97	96	245,600 ac-ft
IDAHO					
Boise River (4 reservoirs) (FIP)	63	63	81	64	1,235,000 ac-ft
Coeur d'Alene Lake (P)	23	198	103	50	238,500 ac-ft
Pend Oreille Lake (FP)	38	82	84	52	1,561,000 ac-ft
IDAHO--WYOMING					
Upper Snake River (8 reservoirs) (MP)	59	65	84	71	4,401,000 ac-ft
WYOMING					
Boysen (FIP)	73	68	74	66	802,000 ac-ft
Buffalo Bill (IP)	54	52	77	62	421,300 ac-ft
Keyhole (F)	21	23	51	44	190,400 ac-ft
Pathfinder, Seminoe, Alcova, Kortes, Glendo, and Guernsey Reservoirs (I)	43	45	62	48	3,056,000 ac-ft
COLORADO					
John Martin (FIR)	10	12	19	17	364,400 ac-ft
Taylor Park (IR)	42	39	49	55	106,200 ac-ft
Colorado–Big Thompson project (I)	45	44	70	55	722,600 ac-ft
COLORADO RIVER STORAGE PROJECT					
Lake Powell; Flaming Gorge, Fontenelle, Navajo, and Blue Mesa Reservoirs (IFPR)	76	62	84	.....	31,620,000 ac-ft
UTAH--IDAHO					
Bear Lake (IPR)	64	64	74	57	1,421,000 ac-ft
CALIFORNIA					
Folsom (FIP)	63	65	70	59	1,000,000 ac-ft
Hetch Hetchy (MP)	52	57	31	28	360,400 ac-ft
Isabella (FIR)	30	32	42	27	568,100 ac-ft
Pine Flat (FI)	53	61	77	56	1,001,000 ac-ft
Clair Engle Lake (Lewiston) (P)	82	86	84	79	2,438,000 ac-ft
Lake Almanor (P)	90	93	84	50	1,036,000 ac-ft
Lake Berryessa (FIMW)	93	100	87	86	1,600,000 ac-ft
Millerton Lake (FI)	82	78	59	65	503,200 ac-ft
Shasta Lake (FIPR)	80	83	87	75	4,377,000 ac-ft
CALIFORNIA--NEVADA					
Lake Tahoe (IPR)	57	66	48	52	744,600 ac-ft
NEVADA					
Rye Patch (I)	30	31	85	61	194,300 ac-ft
ARIZONA--NEVADA					
Lake Mead and Lake Mohave (FIMP)	88	89	91	67	27,970,000 ac-ft
ARIZONA					
San Carlos (IP)	23	23	61	21	1,073,000 ac-ft
Salt and Verde River system (IMPR)	58	67	55	44	2,073,000 ac-ft
NEW MEXICO					
Conchas (FIR)	46	46	35	81	330,100 ac-ft
Elephant Butte and Caballo (FIPR)	35	36	55	31	2,453,000 ac-ft

[a]Thousands of kilowatt-hours (the potential electric power that could be generated by the volume of water in storage).

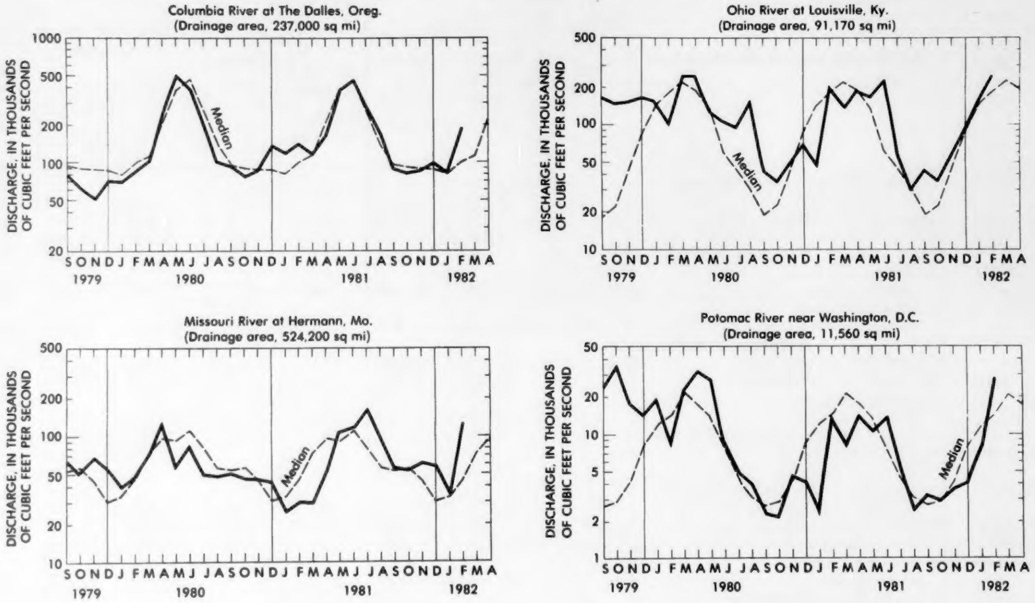
Provisional data; subject to revision

FLOW OF LARGE RIVERS DURING FEBRUARY 1982

Station number*	Stream and place of determination	Drainage area (square miles)	Mean annual discharge through September 1975 (cfs)	February 1982: Monthly mean discharge (cfs)	Percent of median monthly discharge, 1951–80	Change in discharge from previous month (percent)	Discharge near end of month (cfs)	(mgd)	Date
1–0140	St. John River below Fish River at Fort Kent, Maine	5,690	9,549	2,093	106	-44	1,900	1,230	28
1–3185	Hudson River at Hadley, N.Y	1,664	2,853	1,820	107	-2	1,300	840	28
1–3575	Mohawk River at Cohoes, N.Y	3,456	5,630	5,020	101	+19	3,200	2,100	28
1–4635	Delaware River at Trenton, N.J	6,780	11,630	13,581	111	+32	7,350	4,750	28
1–5705	Susquehanna River at Harrisburg, Pa	24,100	34,200	46,400	115	+101	43,300	28,000	25
1–6465	Potomac River near Washington, D.C	11,560	[1] 11,190	28,500	178	+245	22,900	14,800	28
2–1055	Cape Fear River at William O. Huske Lock near Tarheel, N.C	4,810	5,007	10,000	111	+6	7,250	4,690	28
2–1310	Pee Dee River at Peedee, S.C	8,830	9,657	20,700	136	-4	21,100	13,600	25
2–2260	Altamaha River at Doctortown, Ga	13,600	13,780	31,580	143	+18	30,200	19,500	25
2–3205	Suwannee River at Branford, Fla	7,880	6,970	7,440	92	+46	7,730	5,000	28
2–3580	Apalachicola River at Chattahoochee, Fla	17,200	22,330	48,600	153	+52	19,800	12,800	28
2–4670	Tombigbee River at Demopolis lock and dam near Coatopa, Ala	15,400	22,570	44,710	99	-12	24,300	15,700	26
2–4895	Pearl River near Bogalusa, La	6,630	9,263	18,364	108	+119	14,800	9,570	28
3–0495	Allegheny River at Natrona, Pa	11,410	[1] 19,210	31,686	124	+38	32,400	20,900	23
3–0850	Monongahela River at Braddock, Pa	7,337	[1] 12,360	24,429	133	+8	31,300	20,200	23
3–1930	Kanawha River at Kanawha Falls, W.Va	8,367	12,530	32,680	172	+83	24,200	15,600	28
3–2345	Scioto River at Higby, Ohio	5,131	4,513	15,440	215	+178	12,200	7,890	26
3–2945	Ohio River at Louisville, Ky[2]	91,170	114,100	253,500	145	+56	314,500	203,300	22
3–3775	Wabash River at Mount Carmel, Ill	28,635	27,030	98,320	265	+116	144,000	93,100	28
3–4690	French Broad River below Douglas Dam, Tenn	4,543	[1] 6,794	15,049	147	+23	......	......	...
4–0845	Fox River at Rapide Croche Dam, near Wrightstown, Wis[2]	6,150	4,185	2,179	60	-27	3,290	2,130	28
02MC002 (4–2643.31)	St. Lawrence River at Cornwall, Ontario–near Massena, N.Y[3]	299,000	241,100	250,600	108	+4	255,000	165,000	28
050115	St. Maurice River at Grand Mere, Quebec	16,300	25,300	4,010	65	-37	21,600	14,000	27
5–0825	Red River of the North at Grand Forks, N. Dak	30,100	2,524	1,076	97	-9	1,280	827	28
5–1335	Rainy River at Manitou Rapids, Minn	19,400	12,950	8,100	87	-1	8,250	5,330	18
5–3300	Minnesota River near Jordan, Minn	16,200	3,412	603	119	-29	755	488	28
5–3310	Mississippi River at St. Paul, Minn	36,800	[1] 10,580	5,378	109	+24	5,810	3,760	28
5–3655	Chippewa River at Chippewa Falls, Wis	5,600	5,110	2,032	62	-23	3,510	2,270	22
5–4070	Wisconsin River at Muscoda, Wis	10,300	8,613	6,721	97	+25	7,400	4,800	25
5–4465	Rock River near Joslin, Ill	9,551	5,852	5,240	91	+70	10,000	6,500	28
5–4745	Mississippi River at Keokuk, Iowa	119,000	62,570	50,200	121	+39	94,600	61,100	28
6–2145	Yellowstone River at Billings, Mont	11,796	6,986	3,034	122	+59	4,600	3,000	28
6–9345	Missouri River at Hermann, Mo	524,200	79,750	128,200	261	+214	140,000	90,500	28
7–2890	Mississippi River at Vicksburg, Miss[4]	1,140,500	573,600	997,800	147	+80	966,000	624,000	22
7–3310	Washita River near Durwood, Okla	7,202	1,414	1,577	379	+401	760	490	28
8–2765	Rio Grande below Taos Junction Bridge, near Taos, N. Mex	9,730	724	460	95	+20	518	335	24
9–3150	Green River at Green River, Utah	40,600	6,366	3,930	131	+80	5,730	3,700	24
11–4255	Sacramento River at Verona, Calif	21,257	19,150	50,471	132	-12	72,700	47,000	19
13–2690	Snake River at Weiser, Idaho	69,200	18,170	34,160	175	+150	56,800	36,700	24
13–3170	Salmon River at White Bird, Idaho	13,550	11,290	7,916	172	+69	1,630	1,050	24
13–3425	Clearwater River at Spalding, Idaho	9,570	15,570	25,720	282	+348	21,300	13,800	24
14–1057	Columbia River at The Dalles, Oreg[5]	237,000	194,600	195,800	189	+141	......	......	...
14–1910	Willamette River at Salem, Oreg	7,280	23,810	74,300	169	+42	105,700	68,300	28
15–5155	Tanana River at Nenana, Alaska	25,600	23,850	4,871	76	-20	4,300	2,800	26
8MF005	Fraser River at Hope, British Columbia	83,800	96,400	31,600	93	+7	31,800	20,600	25

[1] Adjusted.
[2] Records furnished by Corps of Engineers.
[3] Records furnished by Buffalo District, Corps of Engineers, through International St. Lawrence River Board of Control. Discharges shown are considered to be the same as discharge at Ogdensburg, N.Y. when adjusted for storage in Lake St. Lawrence.
[4] Records of daily discharge computed jointly by Corps of Engineers and Geological Survey.
[5] Discharge determined from information furnished by Bureau of Reclamation, Corps of Engineers, and Geological Survey.
*The U.S. station numbers as listed in this table are in a shortened form previously in use, and used here for simplicity of tabular and map presentation. The full, correct number contains 8 digits and no punctuation marks. For example, the correct form for station number 1–3185 is 01318500.

HYDROGRAPHS OF FOUR LARGE RIVERS



WATER RESOURCES REVIEW

February 1982

Based on reports from the Canadian and U.S. Field offices; completed March 11, 1982

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EXPLANATION OF DATA

Cover map shows generalized pattern of streamflow for February based on 18 index stream-gaging stations in Canada and 164 index stations in the United States. Alaska and Hawaii inset maps show streamflow only at the index gaging stations which are located near the points shown by the arrows.

Streamflow for February 1982 is compared with flow for February in the 30-year reference period 1951–80. Streamflow is considered to be *below the normal range* if it is within the range of the low flows that have occurred 25 percent of the time (below the lower quartile) during the reference period. Flow for February is considered to be *above the normal range* if it is within the range of the high flows that have occurred 25 percent of the time (above the upper quartile).

Flow higher than the lower quartile but lower than the upper quartile is described as being *within the normal range*. In the Water Resources Review the median is obtained by ranking the 30 flows of the reference period in their order of magnitude; the highest flow is number 1, the lowest flow is number 30, and the average of the 15th and 16th highest flows is the median.

The normal is an average (but not an arithmetic average) or middle value; half of the time you would expect the February flows to be below the median and half of the time to be above the median. Shorter reference periods are used for the Alaska index stations because of the limited records available.

Statements about *ground-water levels* refer to conditions near the end of February. Water level in each key observation well is compared with average level for the end of February determined from the entire past record for that well or from a 30-year reference period, 1951–80. *Changes in ground-water levels,* unless described otherwise, are from the end of January to the end of February.

The Water Resources Review is published monthly. Special-purpose and summary issues are also published. Subscriptions to the Review are free on application to the Water Resources Review, U.S. Geological Survey, MS 420, Reston, Virginia 22092.

THE GEOTHERMAL HYDROLOGY OF WARNER VALLEY, OREGON: A RECONNAISSANCE STUDY

The abstract and illustrations below are from the report, *The geothermal hydrology of Warner Valley, Oregon: a reconnaissance study*, by Edward A. Sammel and Robert W. Craig, U.S. Geological Survey Professional Paper 1044-I, 47 pages, 1981. This report may be purchased for $4.00 from Eastern Distribution Branch, USGS, 604 S. Picket St., Alexandria, VA 22304 (check or money order payable to U.S. Geological Survey); or from Superintendent of Documents, Government Printing Office, Washington, D.C. 20402 (payable to Superintendent of Documents).

ABSTRACT

Warner Valley and its southern extension, Coleman Valley, are two of several high-desert valleys in the Basin and Range province of south-central Oregon that contain thermal waters. (See figure 1.) At least 20 thermal springs, defined as having temperatures of 20°C or more, issue from Tertiary basaltic flows and tuffs in and near the valleys. Many shallow wells also produce thermal waters. The highest measured temperature is 127°C, reported from a well known as Crump geyser, at a depth of 200 meters. The hottest spring, located near Crump geyser, has a surface temperature of 78°C. The occurrence of these thermal waters is closely related to faults and fault intersections in the graben and horst structure of the valleys.

Chemical analyses show that the thermal waters are of two types: sodium chloride and sodium bicarbonate waters. The warmer waters are likely to have higher concentrations of sodium and chloride, as well as sulfate, silica, and dissolved solids, than the cooler waters. Chemical indicators show that the geothermal system is a hot-water rather than a vapor-dominated system.

Conductive heat flow in areas of the valley unaffected by hydrothermal convection is probably about 75 milliwatts per square meter. The normal thermal gradient in valley-fill deposits in these areas may be about 40°C per kilometer. (See figure 2.) Extensive areas underlain by thermal ground water occur near Crump geyser and Fisher Hot Spring. These two areas, located along the western and eastern boundary faults, respectively, are believed to be zones in which hot water, derived from geothermal reservoirs, spreads from the fault zones and mixes with local ground water. Thermal gradients in the valley-fill deposits are extremely high in these areas.

Geothermometers and mixing models indicate that temperatures of equilibration are at least 170°C for the thermal components of the hotter waters. The thermal waters probably originate as local meteoric water which circulates to great depths in the fault zones. The depth of circulation may be as great as 4 kilometers, on the basis of the thermal gradients (about 40°C per kilometer) estimated for the valley-fill deposits and bedrock.

The size and location of geothermal reservoirs are unknown. If the mixing models are valid, thermal waters of the Crump geyser area and the Fisher Hot Spring area could be derived from a common reservoir. If so, a probable maximum size for such a reservoir is about 38 cubic kilometers at a depth near 4 kilometers. Total heat stored in the reservoir, above a base temperature of 10°C, could be as much as 1.6×10^{19} joules. A probable minimum value for stored heat, estimated on the basis of the assumption that the thermal fluids at depth are entirely restricted to the major boundary faults, may be about 5×10^{16} joules.

The reservoir at a depth of 4 kilometers constitutes a resource under present economic conditions only to the extent that hot water can be withdrawn from upflow conduits at shallower depths. Because of conductive cooling, water temperatures in the upflow conduits will have lower temperatures than water in the reservoir. Recoverable heat stored in mixing zones in the valley-fill deposits at depths less than 300 meters may total at least 5×10^{16} joules, however, and may represent an economic resource at temperatures greater than 100°C.

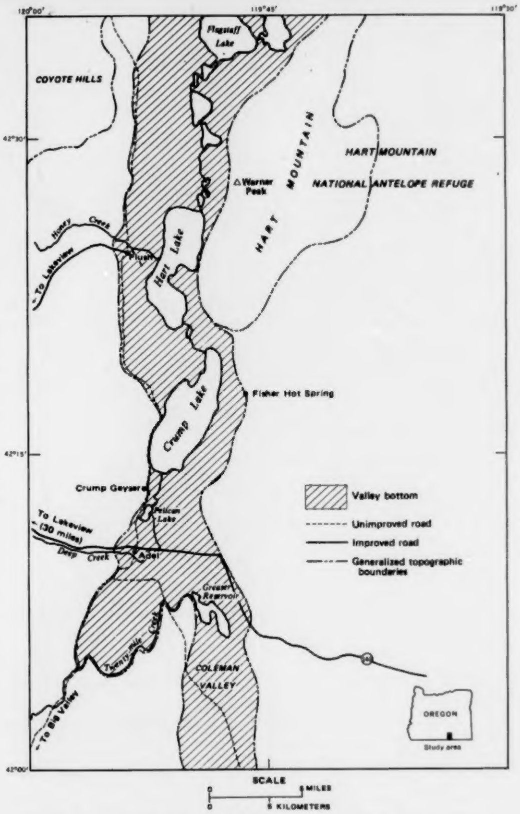

Figure 1.—Index map of the Warner Valley area, Oregon.

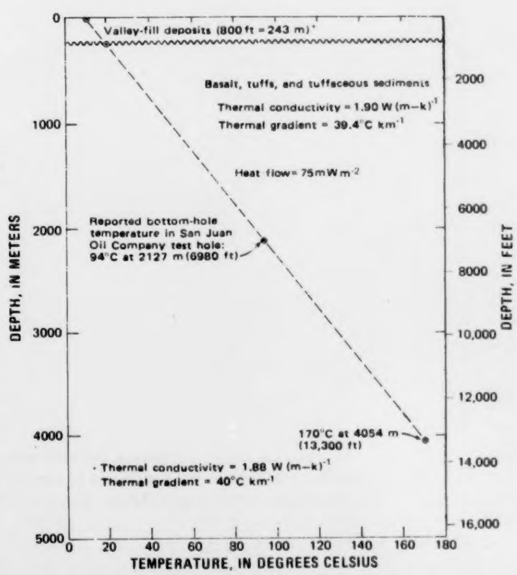

Figure 2.—Hypothetical profile of normal temperature versus depth in Warner Valley.

☆U.S. Government Printing Office : 1982 -361-117/6402

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